

**UNITED STATES PATENT APPLICATION**

**OF**

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**FOR**

**NOZZLE ASSEMBLY OF DISHWASHER**

[0001] This application claims the benefit of Korean Application No. 10-2002-0074990 filed on November 29, 2000, which is hereby incorporated by reference.

## BACKGROUND OF THE INVENTION

### Field of the Invention

[0002] The present invention relates to a nozzle assembly for use in a dishwasher, and more particularly, to such a nozzle assembly having an auxiliary nozzle mounted on a main nozzle using interlocking connectors to reduce a vertical installation space.

### Discussion of the Related Art

[0003] Generally speaking, a dishwasher is provided with a water circulation means actuated by a wash pump. Thus, the washing of tableware and the like is performed by spraying washing water onto the tableware, which is placed on a sliding rack to be washed. The spraying action is achieved by a nozzle rotating under the force of the wash pump. To improve washing performance, a main nozzle may be provided with an auxiliary nozzle, which rotates on the main nozzle, as a nozzle assembly. Wash performance may be further improved by increasing the length of the auxiliary nozzle through an S-shaped configuration.

[0004] Referring to FIGS. 1 and 2, a dishwasher having a nozzle assembly according to a related art is comprised of a body 2 forming an exterior shape; a door 2a installed at a front side of the body; a washtub 4, installed in the body, where a sliding rack 6 for holding tableware and the like to be washed is installed; and a nozzle assembly 10, communicating with a water circulating means via an injection passage 8, for spraying water onto the tableware in the sliding rack. The nozzle assembly 10 is rotatably installed off-center with respect to the end of the injection passage 8, such that a main nozzle 12 has a short end and a long end, with an auxiliary nozzle 14 being rotatably coupled to the top of the short end of the

main nozzle.

[0005] A plurality of injection holes 14h are provided on the top surface of the auxiliary nozzle 14 for spraying water toward the sliding rack 6, and a first cylindrical connector 16 having a flanged end 16b is disposed at the midpoint of its bottom surface.

5 The first cylindrical connector 16 has a passage hole 16h of a predetermined diameter for allowing water to flow from the main nozzle 12.

[0006] A plurality of injection holes 12h are provided on a top surface of the long end of the main nozzle 12 for spraying water toward the sliding rack 6, and a second cylindrical connector 18 for receiving the first connector 16 of the auxiliary nozzle 14 is disposed at the  
10 short end. The second cylindrical connector 18 has a passage hole 18h of a predetermined diameter for allowing water to flow into the auxiliary nozzle 14.

[0007] The first and second cylindrical connectors 16 and 18 are screw-coupled to each other, thus coupling the auxiliary nozzle 14 to the main nozzle 12 and allowing water to flow from the main nozzle to the auxiliary nozzle via the passage holes 16h and 18h. To  
15 achieve the screw-coupling, the main nozzle 12 has a threaded coupling flange 12a having female threads and protruding upward to receive the male threads of a first connector coupler 16a provided at the bottom end of the first connector 16, and the auxiliary nozzle 14 has a threaded coupling flange 14a having female threads and protruding downward to receive the male threads of a second connector coupler 18a provided at the top end of the second  
20 connector 18. Thus, the second connector 18 is rotatably installed on the outer circumference of the first connector 16, so that the flanged end 16b of the first connector is caught on the second connector.

[0008] In the operation of a dishwasher having the nozzle assembly according to the related art, however, water is pumped from the water circulation means, which causes the

main nozzle 12 to rotate on the injection passage 8 and the auxiliary nozzle 14 to rotate on the main nozzle. As the auxiliary nozzle 14 rotates on the main nozzle 12, one or both of the first and second connectors 16 and 18 may become decoupled from the auxiliary and main nozzles, respectively. To guard against such a decoupling, a minimum thread length versus  
5 diameter should be secured for each of the connector couplers 16a and 18a. This minimum length is a hindrance to minimizing a vertical installation space. Moreover, manipulation of the threaded components during assembly is cumbersome.

#### SUMMARY OF THE INVENTION

10 [0009] Accordingly, the present invention is directed to a nozzle assembly of a dishwasher that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

[0010] An object of the present invention, which has been devised to solve the foregoing problem, lies in providing a nozzle assembly of a dishwasher, which reduces a  
15 vertical installation space required for installing an auxiliary nozzle on a main nozzle.

[0011] It is another object of the present invention to provide a nozzle assembly that improves productivity during an assembly stage of a dishwasher adopting the nozzle assembly.

[0012] Additional features and advantages of the invention will be set forth in the description which follows, and in part will be apparent to those having ordinary skill in the art  
20 upon examination of the following or may be learned from a practice of the invention. The objectives and other advantages of the invention will be realized and attained by the subject matter particularly pointed out in the specification and claims hereof as well as in the appended drawings.

[0013] To achieve these objects and other advantages in accordance with the present

invention, as embodied and broadly described herein, there is provided a nozzle assembly of a dishwasher, comprising a main nozzle having a first coupling hole; an auxiliary nozzle, having a second coupling hole, for coupling with the main nozzle; first interlocking means, having a first end, for coupling with the main nozzle at the first coupling hole, by being caught in the first coupling hole by the first end; and second interlocking means, having a first end, for coupling with the auxiliary nozzle at the second coupling hole, by being caught in the second coupling hole by the first end and by having a second end to be caught on the first interlocking means.

[0014] It is to be understood that both the foregoing explanation and the following detailed description of the present invention are exemplary and illustrative and are intended to provide further explanation of the invention as claimed.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0015] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate embodiment(s) of the invention and together with the description serve to explain the principle of the invention. In the drawings:

[0016] FIG. 1 is a cross-sectional view of a dishwasher having a nozzle assembly according to a related art;

[0017] FIG. 2 is a breakaway side view of the nozzle assembly shown in FIG. 1;

[0018] FIG. 3 is a cross-sectional view of a dishwasher having a nozzle assembly according to the present invention;

[0019] FIG. 4 is a breakaway view of the cross-section A of FIG. 3;

[0020] FIG. 5 is a breakaway side view of a nozzle assembly according to the present

invention; and

[0021] FIG. 6 is a breakaway perspective view of the nozzles of the nozzle assembly according to the present invention.

5 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0022] Reference will now be made in detail to the preferred embodiment of the present invention, examples of which are illustrated in the accompanying drawings. Throughout the drawings, like elements are indicated using the same or similar reference designations where possible.

10 [0023] Referring to FIGS. 3-6 a dishwasher having a nozzle assembly according to a related art is comprised of a body 52 forming an exterior shape; a washtub 4, installed in the body, where a sliding rack 56 for holding tableware and the like to be washed is installed; and a nozzle assembly 60, communicating with a water circulating means via an injection passage 58, for spraying water onto the tableware in the sliding rack. The nozzle assembly 60 is  
15 rotatably installed off-center with respect to the end of the injection passage 58, such that a main nozzle 62 has a short end and a long end, with an auxiliary nozzle 64 being rotatably coupled to the top of the short end of the main nozzle.

[0024] A plurality of injection holes 64h are provided on the top surface of the auxiliary nozzle 64 for spraying water toward the sliding rack 56 and a first interlocking  
20 connector 66 is disposed at the midpoint of its bottom surface. The first interlocking connector 66 has a passage hole 66h of a predetermined diameter for allowing water to flow from the main nozzle 62 and for facilitating its coupling with the auxiliary nozzle 64.

[0025] A plurality of injection holes 62h are provided on a top surface of the long end of the main nozzle 62 for spraying water toward the sliding rack 56, and a second interlocking

connector 68 for receiving the first connector 66 of the auxiliary nozzle 64 is disposed at the short end. The second interlocking connector 68 has a passage hole 68h of a predetermined diameter for allowing water to flow into the auxiliary nozzle 64 and for facilitating its coupling with the main nozzle 62.

5       **[0026]** Accordingly, the first and second interlocking connectors 66 and 68 are coupled to each other, thus coupling the auxiliary nozzle 64 to the main nozzle 62 and allowing water to flow from the main nozzle to the auxiliary nozzle via the passage holes 66h and 68h. To achieve the coupling, the first connector 66 is interlocked with the coupling hole 62a of the main nozzle 62, and the second connector 68 is interlocked with the coupling  
10       hole 64a of the auxiliary nozzle 64 while being caught on the first connector. The lips of the coupling holes 62a and 64a are each notched to receive and catch a plurality of protrusions (described later) formed on the first and second connectors 66 and 68, respectively, which are inserted in the coupling holes and rotated during assembly.

15       **[0027]** The above interlocking action is achieved by a first interlocking means of the first connector 66 acting on the coupling hole 62a of the main nozzle 62 and a second interlocking means of the second connector 68 acting on the coupling hole 64a of the auxiliary nozzle 64 and on the first connector. That is, the first connector 66 comprises a first flange 66a on the outer circumference of its upper end, to abut on the lip of the coupling hole 62a of the main nozzle 62; and a plurality of first protrusions 66b on the outer  
20       circumference of its lower end, to be caught on the lip of the main nozzle's coupling hole when, during assembly, the first connector is rotated by a predetermined angle until stopped by at least one slotted stop 67b formed in the second connector. Meanwhile, the second connector 68 comprises a plurality of second protrusions 68a on the outer circumference of its upper end, to be caught on the lip of the coupling hole 64a of the auxiliary nozzle 64 when,

during assembly, the second connector is rotated by a predetermined angle until stopped by at least one slotted stop 67a formed in the first connector; a second flange 68b on an outer circumference of its lower end, to be caught on the lower end of the first connector 66; and a load-bearing shaft 68c extending between the second protrusions and the second flange, to be inserted in the passage hole 66h of the first connector. Thus, the diameter of the passage hole 66h of the first connector 66 is greater than a diameter "a" of the load-bearing shaft 68c of the second connector 68, so that the first connector can be rotatably installed on the second connector.

[0028] The second connector 68 further comprises a plurality of supports 68d to provide a counteracting support, with respect to the opposite inner wall of the main nozzle 62, allowing the second flange 68b of the second connector 68 to be caught on the lower end of the first connector 66 while the first protrusions 66b of the first connector are interlocked with the coupling hole 62a of the main nozzle 62. Each support 68d has a height "b" determined by the equation  $d + c + b = h$ , where "d" is the thickness of the first protrusions 66b, "c" is the thickness of the second flange 68b, and "h" is the inner height of the main nozzle 62.

[0029] Though not specifically shown in the drawings, the formation of the first and second slotted stops 67a and 67b may overlap the first and second protrusions 66b and 68a, respectively.

[0030] In assembling the nozzle assembly according to the present invention, the load-bearing shaft 68c of the second connector 68 is fitted into the first connector 66 so that the lower end of the first connector is seated against the second flange 68b. Then, with the first protrusions 66b fitted into the coupling hole 62a of the main nozzle 62, so that the supports 68 are pressed against the opposite inner surface of the main nozzle 62 and the first flange 66a is seated against the lip of the coupling hole 62a, the first and second connectors



66 and 68 are rotated together by a predetermined angle, for example, an angle of less than  $\pm 90^\circ$ . The rotation is stopped at a predetermined angle, greater than the above angle of rotation, by the slotted stop 67a of the first connector.

[0031] Subsequently, the second protrusions 68b are fitted into the coupling hole 64a of the auxiliary nozzle 64, and the second connector 68 is rotated by a predetermined angle, for example, an angle of less than  $\pm 90^\circ$ . The rotation is stopped at a predetermined angle, greater than the above angle of rotation, by the slotted stop 67b of the second connector.

[0032] By adopting the nozzle assembly of a dishwasher according to the present invention, wherein an auxiliary nozzle is mounted on one end of a main nozzle, a vertical installation space required for installing the auxiliary nozzle on the main nozzle by respectively coupling the first and second interlocking connectors to the nozzles, to be rotatably interlocked at one end of each connector, and providing protrusions at the other ends thereof to be coupled with and caught on coupling holes provided in each nozzle. Moreover, since the first and second protrusions are installed to be caught in the coupling holes by a simple rotation (twisting action) of the connectors, assembly is simplified and productivity is improved accordingly.

[0033] It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover such modifications and variations, provided they come within the scope of the appended claims and their equivalents.